

Monitoring Monday - Let's look at monitoring stormwater.

Join us each Monday as the Clean Water Team shares resources on a water quality monitoring. This Monday is about monitoring stormwater.

Monitoring and tracking storm water helps us understand how well storm water management activities are working. Developing the capability to understand the utility and accurately evaluate the water quantity and the benefits of an increasingly diverse number of urban storm water control measures represents a significant challenge that requires new approaches. Innovative partnerships between permittees, community-based organizations, industry can play a role in these approaches.

Activities by citizen water quality monitors and community-based organizations can play a part of ensuring more healthful storm water discharges. These activities can range beyond watershed education and BMP demonstration projects, to include the monitoring of storm water, documenting probable unpermitted and illicit discharges, to assessing green infrastructure performance.

Since storm and combined storm-sewer systems exist to carry storm water runoff, they are generally monitored during rain events. However, without the presence of rain, water flowing from any storm water outfall, sometimes called nuisance flow, may also discharge polluted water. Actions taken during these wet and dry weather monitoring events can typically be placed into a few monitoring categories:

1. Sensory data: Documenting visual (heavy foam, suds, oily sheen, trash, gray or discolored water...) and or odor (sewage, chlorine, rotten eggs, detergents) indicators. Data is typically in the form of photographs (geotagged and time-stamped) with an accompanying field data sheet.
2. Physical measurements: Measuring and documenting the physical properties of water (color, turbidity, temperature). Discharge and duration are also useful and much needed information.
3. Water Quality Analysis: Testing stormwater for toxicity and chemicals, such as: pesticides and herbicides; oil and grease; metal(loid)s such as Cd, Cr, Cu, Ni, Pb, and Zn; and nutrients such as N and P.
 - a. Sample analysis can be performed under a QAPP.
 - b. Samples can be analyzed by an ELAP approved laboratory (samples collected under a simple QAPP).

Many citizen / community water quality monitoring programs have developed storm event (weather responsive) storm water sampling teams. When it starts to rain, these on-call storm water monitors pull on their rubber boots, put on rainwear, and then head out to local rivers, streams and waterways to collect samples in areas suspected of disproportionately impacted by urban or industrial runoff.

If your organization or program is unable to create storm event monitoring project, it's still possible to help storm water management obtain useable data. Most citizen / community water quality monitoring projects typically conduct ambient stream monitoring. The data obtained through this type of monitoring is helpful to augment storm event runoff monitoring and to establish a general baseline for determining impacts to a receiving waterbody. Many have also added biological monitoring (benthic

macroinvertebrates, periphyton, algae...) and habitat assessment to their annual ambient water quality monitoring programs. Making this data publicly available through CEDEN.org and working with stormwater partners helps expand the utility of this data set towards better understanding and improving water quality management programs.

For further information we have assembled this short list of storm water monitoring resources. Citizen and community monitoring resources can be obtained from the [Clean Water Team](#), [Volunteer Water Monitoring Network](#) and the [NWQMC- Volunteer Monitoring Programs](#).

RESOURCES:

An Introduction to Stormwater Indicators

Stormwater indicators provide a suite of opportunities to assess different aspects of a stormwater management program, measure the stressors associated with human activity on the land surface, and establish the conditions of aquatic communities in the receiving waters.

www.casqa.org/sites/default/files/effectiveness_assessment/rl-06_cwp_article_141_practice_of_watershed_protection.pdf

Construction Site Monitoring Program Guidance Manual

This manual presents guidance for California Department of Transportation (Caltrans) staff and contractors to use in the planning and implementation of stormwater monitoring programs at construction sites, in compliance with the State of California's Construction General Permit (CGP) issued by the State Water Resources Control Board (SWRCB): State Water Resources Control Board Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities as amended by Order 2010-0014-DWQ and 2012-006-DWQ, herein called the "Construction General Permit (CGP)," especially Sections I.J, I.K, IX, X, XI, and XII.

http://149.136.20.66/hq/construc/stormwater/caltrans_guidance_manual-rev1.pdf

Design of stormwater monitoring programs

Stormwater runoff is now the leading source of water pollution in the United States, and stormwater monitoring programs have only recently been developed. This paper evaluates several stormwater monitoring programs to identify ways of increasing the likelihood of identification of high-risk dischargers and increasing data reliability for assisting in the development of total maximum daily loads.

<https://www.sciencedirect.com/science/article/abs/pii/S0043135407003211>

Georgia Coastal Stormwater Supplement: Appendix C - Coastal Stormwater Management Practice Monitoring Protocol

This monitoring protocol provides information that can be used to evaluate the performance of green infrastructure and stormwater management practices in coastal Georgia. The protocol presents a simple, yet comprehensive monitoring approach that can be used to accurately evaluate the performance of a wide range of green infrastructure and stormwater management practices.

<https://epd.georgia.gov/document/document/stormwater-monitoring-bmp-protocol/download>

Monitoring to Demonstrate Environmental Results: Guidance to Develop Local Stormwater Monitoring Studies Using Six Example Study Designs

The central purpose of this manual is to provide guidance to MS4 communities on developing monitoring studies whose results can help improve their local stormwater programs by getting more pollutant reduction out of the total community stormwater investment.

https://www.epa.gov/sites/production/files/2015-11/documents/monitoring_guidance_full_report.pdf

Regional Stormwater Monitoring and Urban BMP Evaluation (Prop 13)

Nonpoint source pollution has been identified nationally, in the State of California, and in the Bay Area as the leading source of degradation of natural waters. The magnitude of nonpoint source pollution is accentuated in coastal areas where human population is high and where pressures from urban development, industrial and commercial activities, and recreational use are the greatest. San Francisco Bay is listed as an impaired water body for PCBs and mercury under Section 303(d) of the federal [Clean Water Act](#). The RWQCB has recently developed Total Maximum Daily Load (TMDL) reports for the Bay for [mercury](#) and [PCBs](#).

<https://www.sfei.org/projects/urban-stormwater-bmps-prop-13>

Stormwater Monitoring Guide - 6 Steps to Consider

Stormwater monitoring doesn't have to be a headache for your organization, with proper site, sensor, equipment selection and standardizing on a real-time data acquisition and control system you can be up and running within your compliance or organizational strategy requirements in a relatively short time period.

<https://www.ysi.com/ysi-blog/water-blogged-blog/2015/08/stormwater-monitoring-guide-6-steps-to-consider>

SWRCB Division of Financial Assistance (DFA) Developing a Project Assessment and Evaluation Plan (PAEP)

https://www.waterboards.ca.gov/water_issues/programs/grants_loans/paep/

The Stormwater Manager's Resource Center

The Stormwater Manager's Resource Center is designed specifically for stormwater practitioners, local government officials and others that need technical assistance on stormwater management issues. Created and maintained by the Center for Watershed Protection.

www.stormwatercenter.net/

Urban Stormwater BMP Performance Monitoring

This Manual provides guidance for all stages of BMP monitoring programs ranging from the early stages of study design to the end stages of data interpretation and reporting. Guidance is provided for monitoring a broad range of individual BMPs as well as overall site monitoring with multiple distributed BMPs, such as is the case with LID sites. This Manual focuses primarily on the collection, reporting, and analysis of water quantity and quality measurements at the heart of quantitative BMP efficiency projects. It does not address in detail sediment sampling methods and techniques, biological assessment, monitoring of receiving waters, monitoring of groundwater, streambank erosion, channel instability, channel morphology, or other activities that in many circumstances may be as, or more, Executive Summary Urban Stormwater BMP Performance Monitoring Manual Executive Summary October 2009 Page ES-2 useful for measuring and monitoring water quality for assessing BMP efficiency. In some cases, references for additional information on these subjects have been provided.

www.bmpdatabase.org/Docs/2009%20Stormwater%20BMP%20Monitoring%20Manual.pdf,

U.S. EPA Industrial Stormwater Monitoring and Sampling Guide (EPA 832-B-09-003)

The Industrial Stormwater Monitoring and Sampling Guide ("guide") is a how-to primer for industrial facility operators on how to conduct visual and analytical monitoring of stormwater discharges. The target audience is operators of facilities subject to the U.S. Environmental Protection Agency's (EPA) 2008 Multi-Sector General Permit (2008 MSGP) or a similar State-issued industrial stormwater permit. The information presented will also be useful to anyone interested in industrial stormwater monitoring. The procedures presented in this guide, specifically related to monitoring methodology and quality assurance, will help ensure that stormwater samples yield usable information.

https://www3.epa.gov/npdes/pubs/msgp_monitoring_guide.pdf

U.S. EPA Urban Stormwater BMP Performance Monitoring

This manual provides targeted practical assistance in conducting water quality monitoring and reporting data that are useful for assessing effectiveness of stormwater best management practices (BMPs).

www3.epa.gov/npdes/pubs/montcomplete.pdf

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